

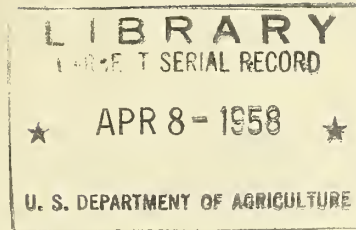
Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

Resume
A423.9
R31

March 1958

ARS 81-5



A SPREADER OF GRANULATED MATERIALS
FOR INSTALLATION ON AN AIRPLANE ✓

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE

Agricultural Research Service

Plant Pest Control Division

Methods Improvement Section

Plant Industry Station

Beltsville, Maryland

Agriculture-Washington

A SPREADER OF GRANULATED MATERIALS FOR INSTALLATION ON AN AIRPLANE

Methods Improvement Section
Plant Pest Control Division
Agricultural Research Service

The increased use of insecticides in granulated form for control of certain soil-inhabiting insects and the acceptance of the airplane as a rapid and effective means of applying pesticides has created a need for specifically designed airborne dispersal equipment. Toward this end, the Plant Pest Control Division of the Agricultural Research Service, U.S.D.A., and the Aircraft Research Center of Texas A & M College cooperatively conducted a program to develop such equipment.

A spreader was designed and installed on a 450-hp Stearman bi-plane for flight testing. More than 130 test flights were flown with successive modifications of the spreader before the desired performance was achieved. A granulated clay of 30-40 mesh size similar to that used as a carrier in many granulated insecticide formulations was used in these tests. The airplane was flown approximately 100 mph and at an average height of 50 feet. The application rate was 20 to 30 pounds of material per acre. In final tests, with the equipment calibrated for an application of 30 pounds per acre, a flight spacing of 40 feet produced the proper overlap of each swath to give an excellent over-all distribution of the material.

The fine performance of this spreader installed on a 450-hp Stearman was demonstrated; however, it should work equally well on other airplanes of similar type and power.

Because of the excellent free-flowing characteristics of granulated pesticides, agitation in a conventional hopper is not required. In fact, agitation may be a disadvantage since it may grind the granules sufficiently to produce dust.

Spreader Description

Although this spreader is similar to many used for seeding or dusting, the proper location and spacing of the vanes is a critical requirement.

A simple Venturi is formed by turning the front of the top of the spreader upward.

A section of the bottom side of the spreader directly below the hopper gate is made removable to permit ground calibration of the equipment. This panel may be hinged and secured so it will be released automatically when the hopper-gate handle is moved to the emergency wide-open position for rapid release of the hopper contents.

A saw-tooth baffle just above the hopper gate provides accurate adjustment and control of the material when the system is calibrated for low rates of output.

Each tooth is in the form of an equilateral triangle and measures approximately 1 inch from apex to base. They are omitted from the portion above the center passage of the spreader to provide a greater output at this location. This is necessary to provide proper distribution of the material throughout the center portion of the swath. The baffle should be installed so that there is minimum clearance between it and the upper surface of the hopper gate.

Construction

The construction of this spreader is comparatively simple, with the top and bottom sections assembled parallel to each other. Internal vanes separating seven longitudinal passages are attached to these sections.

The throat opening on the top side of the spreader should be the full width of the spreader -- 24 inches. The fore and aft dimensions of this opening will be regulated by the size of the hopper-gate section to which the spreader will be attached. It is important that the distance between the front end of the spreader and the center line of the hopper-gate section be 11 3/4 inches.

Fabrication by riveting rather than welding is recommended. It is suggested that 24ST aluminum, .040 to .050 inch thick, be used for construction of the spreader and 90° angle stock for joining all sections.

Installation

The spreader should be installed as close as practicable to the underside of the fuselage, giving consideration to the need for unobstructed air flow into the inlet of the spreader.

Details for attaching the spreader to the hopper-gate assembly will have to be worked out for each installation; however, the gate should be as close to the spreader as possible and the spreader mounted parallel with the airstream.

Struts should be used between the lower longerons and the discharge end of the spreader to brace the assembly.

Calibration

The calibration of the equipment for distribution of granulated pesticides is easily accomplished through the opening provided on the underside of the spreader. The free-flowing characteristics of the granules permit a relatively accurate adjustment of the hopper gate to be made on the ground.

Before any attempt to calibrate is made, the linkage of the hopper-gate control mechanism should be carefully checked for play. Any looseness in the control system might permit the control gate to vibrate and change its position after it has been opened. A very slight change in the position of the gate will make a significant change in the output.

To determine the output rate required, first measure the effective swath produced by the spreader and the working speed of the airplane. Multiply the product of these two figures by .002 to obtain the acreage covered per minute. Multiply this figure by the number of pounds of material to be applied per acre to obtain the pounds per minute that should flow past the hopper gate.

(Example: 40' swath x 100 mph x .002 x 20 pounds of material per acre = 160 lbs. per minute)

Tests have shown that the flow from the spreader in flight is approximately 10 per cent faster than the flow during ground calibration; therefore, to obtain an output of 160 pounds per minute in flight, the equipment should be calibrated on the ground to 9/10 of the desired output. In this instance, 144 lbs. per minute.

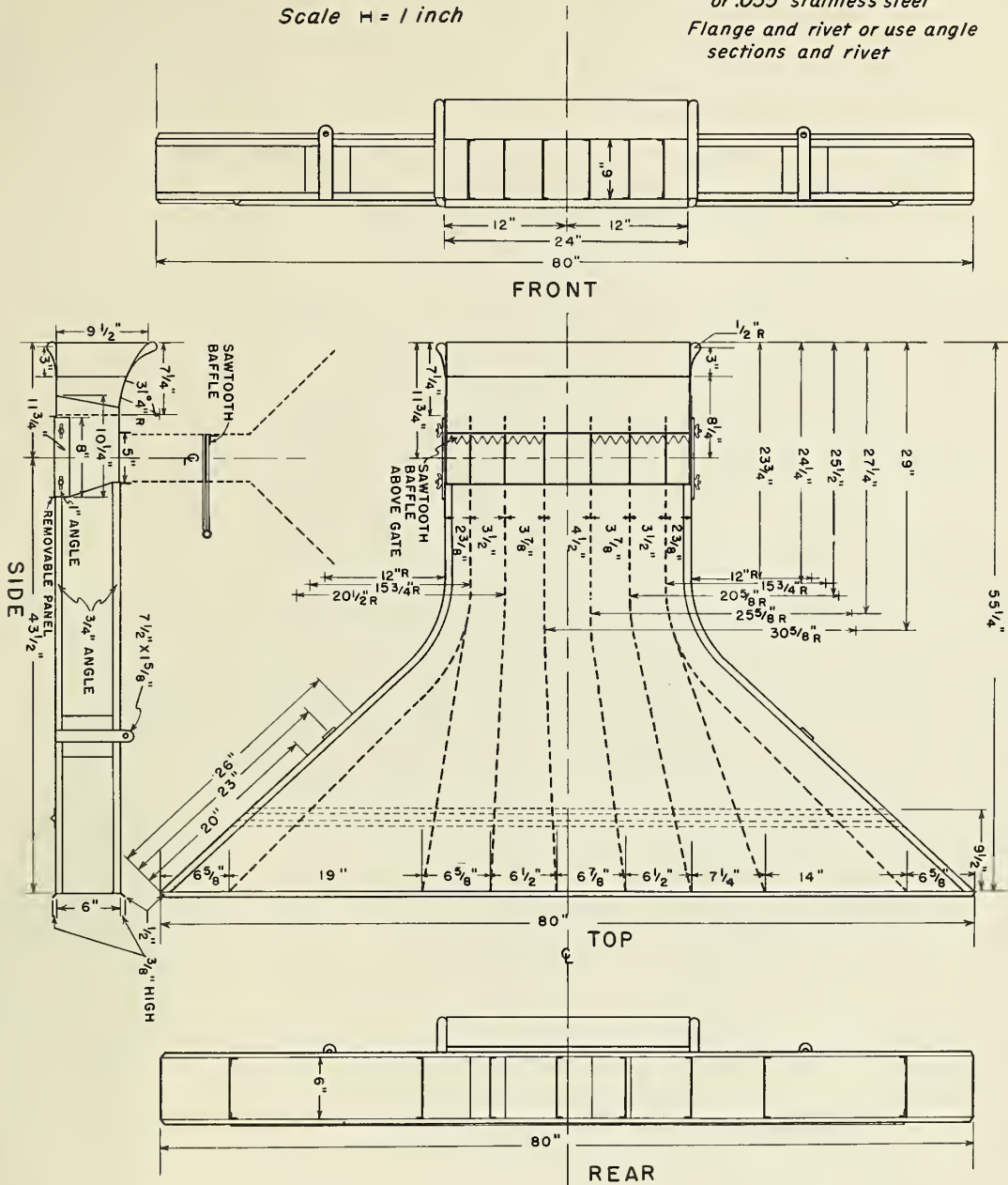
Adjust the hopper-gate handle to permit the gate to open approximately 3/4 of an inch. With the gate closed, dump 50 pounds of the material to be applied into the hopper. Remove the panel from the spreader bottom and place a container below the opening to catch the material. Open the hopper gate and check the time required to empty the hopper. Make the necessary gate adjustment and repeat until the desired flow rate is obtained. A final ground check of the calibration using 100 pounds of material should be made before an in-flight check.

A load of 200 or 300 pounds should be timed in flight over the area to be treated to permit any final adjustment which might be necessary to obtain the exact output required. The calibration should be checked from time to time, as a difference in the flow rate may be obtained with different batches of material.

Recommended material:
.040 to .050-24 ST Aluminum
or .035 stainless steel

Flange and rivet or use angle
sections and rivet

Scale 1" = 1 inch



A SPREADER OF GRANULATED MATERIALS

